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EXAMINER

DHINGRA, RAKESH KUMAR

ART UNIT PAPER NUMBER

1763

DATE MAILED: 08/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/618,603

Applicant(s)

MATSUMOTO ET AL.

Examiner

Rakesh K. Dhingra

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 July 2005.
2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-39 is/are pending in the application.
4a) Of the above claim(s) 1-13, 18, 21, 26 and 28-39 is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 14-17, 19, 20, 22-25 and 27 is/are rejected.
7) ☒ Claim(s) 26-40 is/are objected to.
8) ☒ Claim(s) 1-39 are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 15 July 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 11/04, 3/05
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of Species 8, Figure 9, Claims 14-17, 19-20, 22-27 in the reply filed on 7/26/05 is acknowledged. Claim 26 is not found to be readable on the elected species (Species 8, Figure 9) since it pertains to Species 21, 22 and is thus withdrawn from consideration in accordance with 37 CFR 1.142(b).

Claims 1-13, 18, 21, 26, 28-39 (Species 1-7, 9-22) withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 7/26/05.

Drawings

The drawings are objected to because of following

- 1) Figures 7, 19, 20, 22, 23: it is suggested to change "MAICROWAVE" to "MICROWAVE"
- 2) Figure 21: it is suggested to change 'MIROWAVE" to " MICROWAVE".

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes

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made to the brief description of the several views of the drawings for consistency.

Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

The disclosure is objected to because of the following informalities:

Page 10, line 36: it is suggested to change "10a" to "17";

Page 12, line 17: it is suggested to change "tope" to "top";

Page 18, line 4: it is suggested to change "th" to "the";

Page 18, lines 29- 33: it is suggested to rephrase the sentence "When the covering or coating -----voltage is elevated" to clarify its meaning;

Appropriate correction is required.

Claim Objections

The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

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Misnumbered Claims 26-40 have been renumbered as Claims 25-39.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

1) Claim 16 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Page 12, lines 28-36 disclose other embodiments of antenna like thickness or diameter but do not reasonably disclose shape of antenna like linear and/ or curved line as per scope of invention claimed in Claim 16.

2) Claim 22 rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for other aspects of antenna like material of voltage drawing rod and tube, does not reasonably provide enablement for movement of voltage drawing rod (antenna) with respect to top plate for the elected species (Species 8, Figure 9). The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, regarding which distance is being varied between top plate and voltage drawing rod for the elected species (Species 8, Figure 9), commensurate in scope with the invention of claim 16.

Claim Rejections - 35 USC § 102

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The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 14, 15 are rejected under 35 U.S.C. 102(e) as being anticipated by Glukhoy (US patent No. 6,783, 629).

Regarding Claim 14: Glukhoy teaches a plasma processing apparatus (Figures 1-3, 6, 7) for supplying

microwaves into a process chamber 200 so as to generate plasma P to thereby treat an object W to be processed with the plasma;

wherein the process chamber 200 comprises a top plate 36 and a chamber wall 70 for defining the process chamber; and the chamber wall has at least one antenna 206, 208 so that the antenna penetrates the chamber wall into the inside of the process chamber; and the antenna is disposed in the inside of the process chamber with respect to the top plate (Column 5, lines 15-35 and Column 6, lines 10-30 and Column 8, lines 20-45).

Regarding Claim 15: Glukhoy teaches that the antenna comprises antenna tubes 208a...208n (voltage-drawing rod) for drawing a voltage from a waveguide or resonator 230 disposed outside of the process chamber; and an insulating material 206a...206n surrounding the voltage-drawing rod (Column 8, lines 25-45).

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Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 16, 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Glukhoy (US Patent No. 6,783,629) in view of in view of Tsuchihashi et al (US Patent No. 6,109,208).

Glukhoy teaches all limitations of the claim except shape of antenna.

As already explained above under "Claim rejections - 35 U.S.C. 112", in view of insufficient disclosure, for the purpose of examination, Claim 16 has been interpreted to mean the shape of the antenna.

Tsuchihashi et al teach a plasma apparatus (Figure 1) for supplying microwaves

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(microwave oscillator 2) into a process chamber 1 so as generate plasma, to thereby treat an object to be processed with the plasma. Tsuchihashi et al further teach that at least one antenna 9a is disposed in the process chamber so as to provide a linear and/or curved line and that uniformity of plasma can be improved by combining the antenna structures as necessary (Figures 1, 4, 5 and Column 8, lines 40-50).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use antenna configuration as taught by Tsuchihashi et al in the apparatus of Glukhoy to improve plasma uniformity.

Regarding Claim 22: Glukhoy teaches all limitations of the claim except movement of antenna.

As already explained above under "Claim Rejections – 35 U.S.C. 112", in view of inadequate disclosure regarding changing the distance between top plate and the voltage drawing rod for the elected species 8 (Figure 9), for the purpose of examination it was presumed that the distance being varied is the vertical distance between the top plate and the voltage drawing rod as per invention of Figure 1.

Tsuchihashi et al teach that the plasma apparatus (Figure 10) has means for moving the antenna 9 (voltage driving rod) in the processing vessel 1 (Column 3, lines 58-60 and Column 10, lines 1-5).

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Glukhoy (US Patent No. 6,783,629) in view of Wartski et al (US Patent No. 5,637,150).

Regarding Claim 17: Glukhoy teaches all limitations of the claim except length of voltage drawing rod (antenna).

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Formula given in the claim: $\{(1=2m)/2\} \lambda_{\text{sub.g}} \pm (1/4) \lambda_{\text{sub.g}}$ when solved for integer value of m as 1, gives length of antenna as $5/4 \lambda_{\text{sub.g}}$ and $7/4 \lambda_{\text{sub.g}}$ which are odd multiples of a quarter of the guide wavelength. For other values of integer also, the antenna length would result in odd multiples of a quarter of wavelength.

Wartski et al teach a microwave plasma apparatus (Figure 1) that has plurality of metal antennas 5 disposed inside chamber 4 and where the length of antenna is $k \cdot \lambda / 4$ where k is an odd multiple and λ is the wavelength (Column 2, lines 40-65 and Claim 2).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use antenna length as taught by Wartski et al in the apparatus of Glukhoy to enable optimum coupling of microwave energy with the plasma chamber.

Claims 19, 20, 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Glukhoy (US Patent No. 6,783,629) in view of Minaee et al (US Patent No. 6,558,635).

Regarding Claims 19, 20, 22: Glukhoy teaches all limitations of the claims except tuner and moving of the voltage drawing rod to enable variable coupling between plasma and waveguide.

Minaee et al teach an apparatus (Figure 3) that has means for moving antenna 19 (voltage drawing rod) to enable matching impedance between waveguide 26 and plasma chamber 11 (Column 4, lines 55-62 and Column 5, lines 35-42). Minaee et al further teach that the apparatus has tuning rods 35 and plate 28 for adjusting and tuning

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the waveguide 26 to enable antenna 19 deliver the energy to plasma chamber 11.

Regarding Claim 22 as already explained above under "Claim Rejections – 35 U.S.C.

112", in view of inadequate disclosure regarding changing the distance between top

plate and the voltage drawing rod for the elected species 8 (Figure 9), for the purpose of

examination it was presumed that the distance being varied is the vertical distance

between top plate and the voltage drawing rod as per invention of Figure 1.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the

invention to use tuning and moving means of antenna as taught by Minaee et al in the

apparatus of Glukhoy to match the impedance of the waveguide with the plasma.

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Glukhoy

(US Patent No. 6,783,629) in view of Totonani et al (US Patent No. 6,181,069).

Regarding Claim 23: Glukhoy teaches all limitations of the claim except measuring

device to monitor the plasma.

Totonani et al teach a plasma apparatus (Figure 14) with antennas 45, 46 and that has

a probe 54 (measuring device) disposed above quartz window 44 (top plate) to measure

the luminous intensity of plasma (Column 13, lines 5-10).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the

invention to use a measuring device as taught by Totonani et al in the apparatus of

Glukhoy to monitor the state of plasma.

Claims 24, 25, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Glukhoy (US Patent No. 6,783,629) in view of Nishikawa et al (US Patent No.

6,244,211).

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Regarding Claim 24: Glukhoy teaches all limitations of the Claim except top plate with plurality of holes for passing gas to the processing chamber.

Nishikawa et al teach an apparatus (Figure 1) wherein the process chamber comprises an opposite electrode (top plate) 6 that has gas showerhead 6a for delivery of process gas to the plasma chamber (Column 5, lines 30-35).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use top plate with plurality of holes as taught by Nishikawa et al in the apparatus of Glukhoy to provide a semiconductor device plasma processed uniformly over the entire surface (Column 4, lines 24-25).

Regarding Claim 25: Nishikawa et al teach that the apparatus has a mounting stage (susceptor) 4 for supporting the object 5 to be processed in the process chamber and a bias is applicable to susceptor (Column 5, lines 10-20 and Column 2, lines 40-45).

Regarding Claim 27: Nishikawa et al teach that the opposite electrode (top plate) is made of a silicon based material (Column 3, lines 60-65).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Yoshida (US Patent No. 5,735,993) teaches an apparatus (Figure 1) that has a planar dielectric window 20 provided between antenna 18 and interior of processing chamber 10 and has a cylindrical/conical liner 30 between window 20 and substrate holder 12.

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Tuda et al (US Patent No. 6,054,016) teach a microwave plasma apparatus (Figure 1) that has a rod antenna 9 connected to waveguide 5 and introduces microwaves into process chamber 1 through a dielectric tube 10.

Ovshinsky et al (US Patent No. 4,521,447) teach a microwave plasma apparatus (Figure 1) that has means for moving an antenna 19 in rectilinear movement to maximize transmission of microwave energy to gases.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 16, 22, 23, 24, 25, 27 provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 14, 20, 21, 22, 23, 13 of copending Application No. 10/618602. Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims numbers as given above are essentially the same except that for this application these are for exciting plasma when using microwave frequency, while in the copending application

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the excitation means is with radio frequency means which could be microwave frequency.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Rakesh Dhingra



Parviz Hassanzadeh
Supervisory Patent Examiner
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